

**THE SCOTTISH UNIVERSITIES:
LIVING TRADITIONS? OLD PROBLEMS RENEWED?**

Donald J Withrington

There are few National Institutions of long-standing which have been more powerfully modified by the circumstances of the country than the Universities of Scotland; and they have undoubtedly been gradually adapted in an eminent degree to the particular demands upon them, arising from the circumstances of the people for whose benefit they were designed..... The system is that of a general plan of education by which persons of all ranks may be benefited...⁽¹⁾

This is one of many shrewd and well-informed comments made in 1830 about the distinctive nature of the Scottish universities; it is from the report of the royal commissioners appointed in 1826 to inquire into their condition and, despite what has been written about it,⁽²⁾ that report demonstrates a remarkable sympathy and sensitivity for the intrinsic and evident Scottishness of the five colleges – St Andrews, Glasgow, King's in Old Aberdeen, Edinburgh, and Marischal in New Aberdeen. The quotation provides us with a good starting-point for a discussion of 'living traditions' in Scottish higher education, if only because it stresses what has been too little noticed⁽³⁾ – that universities in the past did not exist in some form of sealed capsule, impervious either to time or to place. In the century before 1830 the Scottish colleges had indeed been much modified and had, sometimes quite differently, adapted themselves in order to meet the changing public demands made of them: 'traditionally' very poorly endowed and thus very dependent on students' fees, they were always vulnerable to changes in customer demand or expectation. But, in adapting, they did not become less Scottish; in some respects, in fact, they distanced themselves still farther in character from universities elsewhere in Britain as they responded to social changes north of the border, while constructing new traditions in the process.

Let us take an example. It is frequently stated that one of the most distinctive characteristics of Scottish education, and especially of Scottish university education, is that it is generalist rather than specialist and that the essence of its intellectual tradition is to be found, in its universities, in that grouping of wide-ranging studies (variously packaged in the last hundred years) which constituted and constitutes the Ordinary degree. It has been claimed, indeed, that this particular form of degree has managed to survive in Scotland, even in its currently weakened state, only after having suffered much

battering at the hands of unsympathetic and antagonistic 19th-century reformers led by a succession of government-appointed commissions.⁽⁴⁾ Now there is no problem about the historical fact of there having long been a prescribed graduating curriculum which incorporated the classical languages, mathematics and physics, and philosophy, which was to be found in all the Scottish universities in much the same form until the 1890s. The problem lies not in what was available, not in the regulations which underpinned the degree, but – if, for example, we look with care at the evidence led before the commission of 1826-30 – in the fact that, from the mid-18th century onwards these regulations were not followed by the great majority of Scottish students, neither in selecting the classes they chose to attend nor in directing the order in which they studied them. For a century and a half after c1750 remarkably few Scottish students graduated, having followed the regular curriculum, and only a very small proportion attended the full course of study of a 'gowned' student without bothering to graduate. Hence, the traditional degree curriculum, with its strong generalist overtones, was apparently not a factor of much importance in the lives of either students or teachers, and in the case of Edinburgh seems to have been of relatively minimal significance, particularly in the earlier decades of the 19th century. What then of the generalist degree as the living mark of the Scottish intellectual tradition? Strange to say, there are very good grounds for arguing that the important concept of that degree, as offering a fittingly rounded education to those who gave studious attention to the whole grouping of its subjects, survived **because of** and not in spite of the 19th-century reformers. Here is the 1830 report again:

The Universities of Scotland have always embraced students of every variety and description; men advanced in life, who attended some of the classes for amusement or in order to recall the studies of early years or to improve themselves in professional education, originally interrupted; or persons engaged in the actual occupations of business, who expect to derive aid in their pursuits from the new applications of Science to the Arts; or young men not intended for any learned profession, or even going through any regular Course of University Education, but sent for one or more years to College, in order to carry their education farther than that of the schools, before they are engaged in the pursuits of trade or of commerce. And all persons may attend any of the classes, in whatever order or manner may suit their different views and prospects. The system of instruction by a course of elaborate lectures on the different branches of Science and Philosophy, continued daily for a period of six months, is admirably calculated to answer all the objects which such persons have in view, as well as to afford much useful instruction to regular students.

To impose one particular course and plan of study upon all students, or indeed to require the observance of any rules whatever on the part of persons of the description above

mentioned, would clearly be destructive of the usefulness and prosperity of the Scotch Universities, and be injurious to the interests of society. We are satisfied that no objects which could be obtained by such a change, in academical discipline or in more systematic arrangement in the mode of teaching, or in the appearance of more of a parade of Schools of Learning, could compensate for the extensive mischief which any changes, subverting the state of things we have now described, would necessarily occasion....⁽⁵⁾

The largest number of the paying customers, therefore, attended no set course but tended to sample, on a 'cafeteria' basis, the menu of classes announced each year by the professors. The commissioners felt they had to tread very warily in their comments about the situation they described, when professorial incomes depended so largely on student fees for attendance on individual classes and when no large subvention from public funds could be anticipated; in such a situation they could not recommend wholesale change. What they did want to see, however, was the introduction of some modest change in the current arrangements: otherwise, they feared, "the important and primary object of the instruction of Youth may be in part overlooked [and] the aids, attention and discipline necessary for the training of regular Students may not engross much of the time of the Professor"⁽⁶⁾ – again, stated to be a particular characteristic of the Edinburgh professoriate who were quite severely criticised for lack of responsibility and care in their dealings with the 'gowned' students.⁽⁷⁾ These regular students, indeed, were often bursars, young lads from poorer backgrounds taking the full graduating course en route to later studies in medicine or law or divinity; if, in Edinburgh and elsewhere, there was evidence that they were being poorly treated by a self-seeking professoriate and this to the detriment of their studies, then the commissioners saw it as their duty to remedy the matter. They argued that it was directly in the national interest that the universities gave special weight of attention to those following the regular degree-course and that, if it were possible, more students should be attracted into taking that course and into graduating. The cafeteria system of course-choice could not be ended, but it should not be allowed to divert so much effort from the proper purposes of university study, which were being harmed by the faulty application to education of "principles applicable to trade": if such principles were fully applied then, in the end, "all universities ought to be abolished, as an abortive and ill-judged attempt to provide by authority what would be more effectually done by the competition of private teachers", in which case "instruction, either to the extent or on principles adapted to the state of society will not be adequately provided". The revival of the degree-course, or the revival of attendance on the degree-course for most students, was what was wanted: government action and parental support were essential.

We are persuaded that the desire for education in the higher branches of Literature and Science is neither so general nor so

strong as of itself to call forth and secure establishments adapted for the general education of the country, without some public institutions tending to establish in public opinion a certain standard of education, which comes in time to be considered necessary for all well-educated persons, and to be incorporated with the general habits of the people.... In Scotland, however, it has always been thought that a systematic Course of Study should be afforded at the Universities to those who may desire systematic training. That is the principle of these Establishments. To leave the Course of Study at the Universities without regulation, would be an entire and fundamental change in the system on which they have hitherto been conducted....⁽⁸⁾

The universities, prompted by government and supported by tradition, could serve the interests of the whole community by acting to restore the degree-course and correct the imbalance which had been brought about by over-reliance on market-forces. There were powerful social as well as intellectual arguments for reviving the more systematic training which, currently, was mainly followed only by those who were obliged to do so, predominantly students from respectably lower-class homes who needed it in order to make their way in the world – and were generally getting a raw deal. In one view of Scottish ‘democratic intellectualism’, the royal commissioners of 1826-30 may perhaps be counted among its more vigorous supporters.

It has become quite usual, in discussions of Scottish traditions in higher education, to claim not only continuity but also universality – that is, to assume that supposedly national traditions must apply in full in all the constituent universities. Yet the voluminous evidence collected so assiduously in the course of the 19th century by royal commissions (1826-30, the late 1830s, 1857-58, 1876-78) brings to view a recurring and perhaps rather surprising feature: important differences among the colleges in all periods, in management structures, teaching-styles, academic policies. There was not even, by the time the first commissioners reported in 1830, a common degree-curriculum – whether or not it was being bypassed by so many of the students of the day. Much has been written about the ‘alien’ character of the common curriculum proposed in the 1830 report, because it suggested moving the logic class from second to third year (with some increase in the time allocated in the early years to classics) and the postponement of studies of natural philosophy and moral philosophy until the final year – thereby, it is said, subverting the traditional and time-honoured centrality of philosophy in Scottish university studies. A closer look at the evidence would give pause to such an analysis. For one thing, as we have already seen, there was certainly no guarantee that the many students who selected courses on the cafeteria system would actually take any classes in philosophy or if, as was likely, they did, that they would attend them in the particular year of study specified in the regulations or in the order laid down there. More than that, while the set curriculum for the degree had not changed in any notable way in either Glasgow or Edinburgh, things were quite

otherwise in the two Aberdeen universities.

In mid-18th century these two smaller universities in Northern Scotland were in trouble. Student numbers were seriously low and something had to be done to bring in more paying customers. What was painfully obvious was that they were losing too many potential students, who might in earlier years have come to them, to the increasing numbers of reconstructed burgh (or even larger parish) schools and to the new-fangled academies which were offering new, useful, modern subjects such as applied mathematics and surveying, book-keeping, commercial history and geography, and modern languages, sometimes in packages of two-year courses publicised as preferable alternatives to lengthy and moribund university studies. Led by Marischal College they revised and revamped their curricula. The “present order of teaching Philosophy”, it was said, had become “very improper”: it forced students to deal with abstractions about evidence and reasoning before they had sufficient knowledge of particular facts on which to reason, and so much time had to be devoted to logic and metaphysics none was left for “some very useful parts of knowledge”. Marischal College’s new curriculum would comprise, therefore, a first year of Latin and Greek (to be continued in supplementary classes later), a second year given over to the descriptive sciences and mathematics, a third year of experimental sciences (physics, mechanics, etc), and a final year of studies of the science of mind (moral philosophy, ethics, logic). This curriculum with slight variants was, in due course, adopted also in Old Aberdeen.⁽⁹⁾ Thus when the 1830 commission reported, there was no shared, traditional and common course in the five universities; and the criticisms levelled at the unreformed curriculum by the royal commissioners had been well rehearsed already in Marischal College over 70 years earlier. The traditional curriculum had in practice ceased to be ‘national’;⁽¹⁰⁾ and the supposedly alien curriculum proposed in the 1830 report was in fact markedly more conservative than the degree-courses actually in operation in Scotland in the two Aberdeen universities; moreover each of these colleges had proportionately larger numbers of students who were bursars and hence committed to follow the radically-revised curriculum and order of study. What was, then, the ‘Scottish’ degree-course?

There were variations on other themes which weakened the commonality or identity of the Scottish universities in the same period. The ‘catechetical’ style of class tutorial-cum-examination which is so strongly associated with Glasgow University and its professor of logic, George Jardine, was much in evidence in Old Aberdeen but not to be found at all in Edinburgh by all accounts: how ‘Scottish’ was it, then? Marischal College in New Aberdeen introduced an entrance examination in 1825, before the appointment of the royal commission, and had its bursars take yearly tests on the classes they had just completed before they were allowed to progress to the next year of study: hence the commissioners’ recommendations in these matters were not drawn out of thin air, had a precedent in the Scottish colleges themselves, and should perhaps not be so readily dubbed alien or unScottish. Yet there is no doubt

that, among the Scottish universities as a whole, their similarities were more remarkable than their distinctiveness; and that to true outsiders, such as English travellers, they seemed very strange but also very alike. They shared certain well-established and powerful attitudes which imposed their own unity.

Most remarkable and most consistent of these was their acceptance of the principle that the Scottish universities were not private institutions (and had never been so) but were public establishments maintained for the benefit of the nation at large. There is hardly a whisper to be heard against this contention in the 19th century. What is also evident is that the university reformers of that century, including the successive royal commissions, were given to laying much stress on their public and national character, in the belief that in Scotland that would be a telling factor in gaining support for change. It was also generally accepted that, as public and national institutions, the universities were plainly liable to state oversight and supervision and also, if it were seen to be in the public interest, to state direction of their affairs. Robert Peel and William Rae, the lord advocate, had agreed that this was so in setting up the commission of enquiry in 1826⁽¹¹⁾; the commissioners in their turn had no doubts in the matter – the Scottish universities formed part of a system and an establishment which had been weakened as the colleges went their own lax ways in the later 18th century, and one of their main duties was to bring them back into a reformed and reinvigorated national structure through the imposition of near-identical administrations, the adoption of a common curriculum and regulations for examination, and raising standards in all by way of common entrance requirements. These recommendations came to be seen as a blue print for national university reform for the remainder of the century, at least as an acceptable minimum. Many individual reformers, such as John Stuart Blackie, also emphasised the public character and national importance of the universities, as a lever by which to gain government funding for new chairs, tutorial assistance or new buildings and to bring government to act against the grim conservatism of university senates.

It should not surprise us, therefore, to find much interest in the 1840s and 1850s in a much more radical reform which would put government very firmly in control over a reconstituted national system: this was to create a new National University of Scotland, a federal structure in which a non-teaching central body would alone examine and grant degrees and would have powers to regulate all matters of common, national, academic importance, with the teaching being carried on in the existing colleges now bereft of their chartered rights to grant their own degrees.⁽¹²⁾ As an instrument for imposing entrance requirements, adding new subjects to the college teaching programmes, stimulating competition among the colleges for academic honours, popularising graduation and increasing the numbers attending university for a 'complete education', it could hardly be bettered. In the late 1840s, indeed, government set itself a striking example of what could be achieved in this way, when it founded the state-funded and state-controlled Queen's University of

Ireland, with constituent teaching but not degree-granting colleges at Belfast, Cork and Galway. Despite this example, the suggestions for some form of federated university for Scotland were not taken up; but in acts of parliament passed in 1858 and 1889 – while no attempt was made to overturn or nationalise ancient chartered rights to grant degrees – the then four Scottish universities (King's and Marischal having been united in 1858) were more firmly tied together than before. These acts incorporated bodies of powerful commissioner-overseers, who laid down common degree regulations (including Honours programmes), determined which additional subjects would be taught and where, redistributed funds and added new government money where necessary, introduced (at last) in 1892 a standard entrance examination for all students **whether intending to graduate or not** (in its practical implications perhaps the most striking of all the changes), and at much the same time admitted women to degree studies.

In the course of the 19th century, therefore, it was the state which asserted, revived and did much to realise the national character of the Scottish universities, aided and abetted by some very lively individual reformers. Yet, for all the achievements from the 1860s onwards in pushing successfully towards a reasonably close-knit and coherent system, the enforced clubbism of the Scottish universities was found to be not always agreeable and sometimes extremely vexing – it had come rather too late in the day to be comfortable. In the early decades of the 20th century, with the emergence of an increasingly heavily state-funded British university system incorporating the provincial English universities and colleges and the federal University of Wales, there was a marked tendency anyway for government to treat universities as separate entities – a development not entirely objectionable to Edinburgh and Glasgow, sometimes ill at ease with their country cousins and with each other; UGC policies meantime tended to be British-wide; salary scales soon were to be awarded on a UK basis; there was apparently little need for, and hardly any comfort to be gained from, a distinctively Scottish grouping. In the expansion scramble of the 1960s and early 1970s, there seemed neither need nor place for formal cooperation or for the defensive assertion of Scottish claims; and the accession to the club of four new members who had no real share in the old heritage did little to strengthen even older existing ties. Thus there is something richly paradoxical in the present situation where, in the very different atmosphere of financial cutback, with direct government intervention of a kind which would have taken the breath away from even the most interventionist reformers in Scotland in the 19th century, and stung by number-led and performance-led formulae for funding, there is a move to run for shelter from Westminster and Whitehall and nestle together under the umbrella of a Scottish Office and Scottish Education Department with which earlier dealings had been less than happy⁽¹³⁾, convincing themselves that there must be, after all, some kind of special security in a shared Scottish distinctiveness, no matter perhaps how that came to be defined.

But let us retrace our steps and seek out other living traditions which stem

from generalism, the 'general plan of education' and the Ordinary degree. Whether or not they came to university to follow the prescribed degree-course, it was common enough for students in the 18th and 19th centuries to arrive both very young and very ill-prepared for their studies. These two factors were bound to have a significance for the way in which subjects were taught at university. Without an entry or matriculation test, except the competition for candidates for open bursaries, and oftener than not badly needing the class fees, the teachers had to accommodate themselves as best they could. Even with the school subjects there was little guarantee of quality or quantity in what had been learned by those youths newly up from their country parishes; and there was no guarantee at all in the case of the part-timers and mature students and other occasional 'hearers'. But it wasn't just a case of starting from first principles; there was still the continuing problem of attracting students to enrol in the first place – even beginning from scratch, there had to be something very positive to attract the customer. A revealing example is provided by the classical languages, for here was an area of study which had been weakening fast since the beginning of the 18th century, at both school and university. No doubt influenced by Enlightenment ideas, but also aware of what might be found appealing by potential students, teachers of classics seem to have extended their classes beyond language training into discussions about the history and geography of antiquity, about Greek politics and Roman social development, rather than to have concentrated almost exclusively on grammar and textual exercises. Successful practice was, it seems, quickly converted into an educational ideal and soon into a tradition – this way of teaching the classics being noted time and again in mid-19th century by English visitors as both adventurous and very Scottish. To create an educational tradition which coincided with one's own economic advantage was remarkable indeed. The knock-on effects of such developments are still with us, for there was no let-up in what soon became a characteristic methodology (differently handled for different subjects) throughout the 19th century. Even with the very considerable extension of secondary schooling after the 1870s, and even with the establishment of the Leaving Certificate in 1888 and free schooling soon thereafter, many university teachers retained the practice of starting with the elements of their subject in a wide-ranging general course which was intended to set the intellectual scene. And it is no coincidence either that, in Scotland but not generally in England, students are still not required to have studied, say, geography or history or biology at school and to have passed public examinations in these subjects before taking them in first year at university, and keeping open the option of moving into a specialist Honours programme in them.

Such open access, combined with the generalist emphasis, is enhanced still further by another distinctive and Scottish feature of university organisation, the faculty entry system – that is, the application of a common standard of entry requirements for admission to all, or virtually all, first-year courses in the faculty (normally available in the general faculties of Arts, Science, Social Sciences; not in professional faculties of Law, Medicine,

Divinity, etc). The faculty entry standard represents a level of general education rather than specific high quality of attainment in any particular subject or subjects, a readiness to be launched into the proving ground of the next stage of more advanced general education rather than to take on at once a chosen specialism. It represents a principle which was demonstrated in the first half of this century by a highly successful collaboration of all the Scottish universities, the old Scottish Universities' Entrance Board which, on the basis of group-examination passes in the Leaving Certificate, issued intending students with an 'Attestation of Fitness' to study at a Scottish university of their choice, leaving them to bargain with the individual university over which faculty or course to enter. Where the faculty entry system is available, it brings with it for the student very considerable flexibility in course-choice, even **after** the student has been admitted to the university – a striking contrast again to what is available in most departmental or course entry systems on the English pattern. Yet this thoroughly traditional entry system and the flexibility it maintains for the student is, almost for the first time, under threat from recent financing arrangements under which funds are allocated on a departmental or 'cost centre' basis; once again what may be admirably suitable to the English departmental entry system is being mis-applied in Scotland and, as so often, not out of malice but out of uncaring or wilful ignorance. Curiously, however, government's introduction of some of the "principles of the market-place" which the 1830 commissioners so disliked has, as a by-product, brought some widening of access to universities and less dependence on school qualifications, for example in the introduction of 'beginner' classes within the degree structure in some subjects which, not long ago, were demanding high standards of prior instruction in those disciplines.

Generalism has also left its mark within the structure of the four-year MA and BSc Honours degrees. These degree courses are not distinctive merely because, unlike their counterparts in England, they are four years rather than three years in length. What is distinctively Scottish about them is that the first two years are deliberately introductory and exploratory; students study three or four subjects for one or two years each and it is only at the end of two years' experience of university-style work in them that they make a final decision about which specialism or related specialisms they will carry through to Honours. This period of settling down and self-evaluation in both known and unknown subjects is generally found to be of high value by the students, and it is remarkable how many Arts and Science students change their intended specialism (as shown on the UCCA application form) in the course of these two years, recognising how misguided or 'blind' through lack of information that earlier choice had been. It is here, therefore, growing from long-held generalist principles, that the Scottishness and the distinctiveness of the four-year degree is to be found. It is certainly not some kind of strangely elongated English three-years Honours degree, which 'happened' because Scottish pupils could leave school a year earlier than their counterparts south of the border. The principles that underpin it do not rely in any way on length of school education or, in many respects, on the wider or narrower groupings of

subjects which are studied in school-leaving examinations. To remove a year from the course length, as is suggested or threatened from time to time, could hardly leave undamaged the concept which it embodies.

There are, then, vestiges of a living tradition of generalism to be found in today's universities – yet they are only remnants, if what we are looking for is the thriving existence of what has been defined as the 'real' evidence of a distinctively Scottish generalism, namely a common and coherent – in effect, compulsory – programme of study with philosophy at its core (if we are to follow Dr Davie), secured by regulations which govern what is taught, how it is to be taught, and in what order it is to be taught. But if that encapsulates the tradition, then we must raise again the question posed earlier in this essay – when, historically, did it exist? It seems we may seek it in vain in and after the closing decades of the 18th century, if we judge from the evidence of the actual studies undertaken by the great majority of Scottish students: measured progress through a set wide-ranging course dominated by philosophy is not what is revealed in the myriad, personalised, heterogeneous selections from the classes on offer, which appear to characterise the main body of student learning in the first half of the 19th century and beyond. If the real strength of the tradition is to be defined by what we know of the fortunes of the degree course in Arts, then there's the rub: for most of the 19th century these were at a low ebb, despite the repeated attempts by government commissioners and others to find some way to revive attendance on the 'regular course of study' (almost any regular course of study) and to have students follow through a 'complete plan of education'. Cruelly, in the last decades of the century when there was at last opportunity to legislate, the world had moved on. In an era of expansionist science, of increasing public demands for new subjects (modern languages, new social sciences) to be added to the university curriculum, the pressure to modify and adapt the universities according to "the circumstances of the country... and... to the particular demands upon them, arising from the circumstances of the people for whose benefit they were designed" ushered in a mixed bag of new degrees: not one unitary and standard curriculum now, but a variety of overlapping curricula with wide opportunities for lesser or greater specialisation, of a kind foreseen in the 1840s by John Stuart Blackie and Alexander Bain.⁽¹⁴⁾ A clear distinguishing feature of the Scottish universities since the mid-18th century had been, as we have seen, their response to the changing requirements of a changing society; and that custom (or tradition?) they honoured again in introducing the diversified degree system which carried them forward into the present century. It may be argued that the universities were turning their backs on an ideal that had served the country well, or had served it well enough in earlier times; but in practice that ideal, of one common and regular course of study, had lost public support and it was perceived to be in the public interest that it should be replaced.

Donald J Withrington, Department of History, University of Aberdeen.

September 1991

References

1. *Report to His Majesty by a Royal Commission of Enquiry into the State of the Universities of Scotland* (PP 1931), 8.
2. In particular by G E Davie, *The Democratic Intellect* (Edinburgh, 1961) 26 et seq.
3. But not by R D Anderson, *Education and Opportunity in Victorian Scotland: schools and universities* (Oxford, 1983), 43-45.
4. Craig Beveridge, Ronald Turnbull, *The Eclipse of Scottish Culture* (Edinburgh, 1989), 77-78.
5. *Report* (1831), 10.
6. *Ibid.*
7. See also Michael Russel, *View of the System of Education at present pursued in the Schools and Universities of Scotland* (Edinburgh, 1813) 100-103.
8. *Report* (1831), 12.
9. D J Withrington, "Education and society" in N T Phillipson, Rosalind Mitchison (eds), *Scotland in the Age of Improvement* (Edinburgh, 1970), 186-188.
10. Russel, *View of the System*, is particularly helpful in pointing out the differences among the universities; see also *Edinburgh Annual Register, 1816* (Edinburgh 1819).
11. There is a lively correspondence in the Peel Papers (British Library) in the later months of 1825 between Peel, then Home Secretary, and Rae about the limits, if any, on the actions of a royal commission.
12. D J Withrington, "The idea of a national university in Scotland, c1820-c1870" in J J Carter, D J Withrington (eds), *The Scottish University System: Distinctiveness and Diversity* (forthcoming).
13. I G C Hutchison, 'The Scottish Office and the Scottish Universities, c1930-c1960' in *ibid.*
14. J S Blackie, *University Reform: eight articles reprinted from the Scotsman newspaper, with a letter to Professor Pillans* (Edinburgh 1848), 44-45; Alexander Bain, "English University Education", a review article in *Westminster and Foreign Quarterly Review*, xlix (1848), 452-55. Bain was greatly exercised by his observation that there were many able students who found the humanities uncongenial but had minds very receptive to the sciences, for whom the unreformed curriculum was offputting and for whom he pressed the introduction of alternative science-based studies – "in fact, every one of the more advanced sciences has the capacity of conferring a mental discipline peculiar to itself..."